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KOGAN CREEK POWER PROJECT

CONCEPTUAL MINE DUMP DESIGN INCORPORATING ASH DISPOSAL RESERVOIRS

CS Energy Ltd

Report No.: 4712 / December, 2002

Kogan Creek Power Project

Conceptual Mine Dump Design Incorporating Ash Disposal Reservoirs

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1. EXECUTIVE SUMMARY

CS Energy's Kogan Creek Power Project will consume 50.60 million ROM tonnes of coal at an average ash content of 24.8 percent (12% moisture basis) over the first 20 years of operation. The coal will be supplied from the nearby Kogan Creek opencut coal mine by a mining contractor at a rate of 2.5 million tonnes per annum.

Runge prepared a 20 Year Mine Plan for the Kogan Creek Mine in January 2000 (Reference 1). This dump study is supplementary to the 20 Year Mine Plan and should be read in conjunction with it.

The power station will generate approximately 619,000 tonnes per annum of ash which will be converted to approximately 645,000 cubic metres per annum of high concentration slurry (HCS).

During the commissioning period and for the first three years of full power station operation, the HCS will be disposed of in an ash dam adjacent to the power station. Thereafter all HCS will be disposed of in HCS reservoirs constructed by the mining contractor within the mine waste dumps. CS Energy will be responsible for the HCS disposal operation.

The volume of HCS requiring disposal in the power station ash dam is 2.15 million cubic metres, and in the mine dumps during Years 4 to 20 inclusive is 10.92 million cubic metres. The total HCS volume to be disposed until the end of Year 20 is 13.07 million cubic metres. See Table 1.1.

Seven HCS reservoirs will be constructed over the life of the mine to contain the HCS volume. The seventh HCS reservoir will be constructed during years 19 and 20 but won't be needed for HCS disposal until Year 20.

The largest reservoir (4.30 million cubic metre capacity) will be constructed in the expit dump and will provide for all HCS disposal from Year 4 to part way through Year 10.

Thereafter a succession of six HCS reservoirs will be constructed in the mine's inpit dumps and filled with HCS. Each HCS reservoir will be constructed and lined in accordance with the requirements of the EMOS of the Kogan Creek Coal Project.

The HCS reservoirs have been designed so that HCS disposal operations have minimal impact on the mining contractor's operation. This has been demonstrated in seven mine situation plans at three yearly intervals over the mine life. The sizes of the HCS disposal reservoirs and mine dumps in each plan have been balanced against the volumes of HCS and mine waste produced.

The HCS reservoir construction schedule has ensured that HCS reservoir capacity is available continuously from Year 4 to Year 20.

Table 1.1

HCS Dumping Schedule

Project Year	ROM Coal to Power Plant (Mt)	HCS Volume Generated (Mcu.m)	Disposal into HCS Reservoir (Mcu.m)								
			PP Ash Dam	# 1	# 2	# 3	# 4	# 5	# 6	# 7	Total
-1	0.60	0.16	0.16								0.16
1	2.50	0.67	0.67								0.67
2	2.50	0.67	0.67								0.67
3	2.50	0.66	0.66								0.66
4	2.50	0.64		0.64							0.64
5	2.50	0.63		0.63							0.63
6	2.50	0.64		0.64							0.64
7	2.50	0.64		0.64							0.64
8	2.50	0.65		0.65							0.65
9	2.50	0.64		0.64							0.64
10	2.50	0.63		0.46	0.18						0.63
11	2.50	0.64			0.64						0.64
12	2.50	0.64			0.64						0.64
13	2.50	0.63			0.16	0.40	0.08				0.63
14	2.50	0.65					0.65				0.65
15	2.50	0.64					0.64				0.64
16	2.50	0.63					0.01	0.61			0.63
17	2.50	0.65						0.65			0.65
18	2.50	0.66						0.29	0.37		0.66
19	2.50	0.65							0.65		0.65
20	2.50	0.65							0.63	0.02	0.65
Total	**50.60**	**13.07**	**2.15**	**4.30**	**1.62**	**0.40**	**1.38**	**1.55**	**1.65**	**0.02**	**13.07**

2. INTRODUCTION AND SCOPE OF WORK

2.1 Introduction

CS Energy is the developer of the 750 megawatt coal fired Kogan Creek Power Project, located approximately 60 kilometres west of Dalby in south east Queensland. Coal will be supplied to the power station at a rate of 2.5 million tonnes per annum from the proposed Kogan Creek opencut coal mine via a four kilometre long conveyor.

The average ash content of the coal is 24.8 percent as received. Power station ash will be disposed of as a high concentration slurry (known as HCS) at a rate of approximately 645,000 cubic metres per annum.

After the first three full years of power generation, all HCS will be disposed of in the mine's waste dumps. The HCS disposal operation will be the responsibility of CS Energy. However, the mining contractor (Golding Contractors Pty Ltd) will be responsible for constructing HCS reservoirs within the waste dumps to permit continuous operation of the HCS disposal system.

Runge has previously prepared conceptual mine designs (Reference 1) to show the extent of pit and dump development at five yearly intervals. The volumes of the dump designs provided for the inclusion of all power station HCS for a 20 year mine life.

CS Energy now wishes to produce a series of conceptual volume-balanced dump designs which show the status of HCS reservoir construction and mine waste disposal at certain milestones in the project.

2.2 Scope of Work

The scope of work can be summarised as:

- Review the ash containment design criteria provided by CS Energy (from the existing October 1999 Environmental Management Overview Strategy or EMOS).

- Develop a practical concept for concurrent HCS disposal and contract mining which complies with the EMOS criteria while minimising the impact on the mining operation. This will be done in consultation with Golding and CS Energy.

- Develop a mine situation plan for the end of project year three (the first three years of ash disposal will be in an ash dam at the power station). Pit progress will be unchanged from the March 2000 report (Reference 1). Assumptions on the swell factor of mine waste (1.15 SF) and the relative density of the HCS (1.20 RD) will be retained from the March 2000 study. The "footprint" of the ROM pad and expit dump from the March 2000 report will not be expanded.

  The expit dump and ROM pad will be re-designed as required to accommodate waste from the pit plus preparation of an HCS reservoir ready to receive power station HCS

from the end of Year 3 (EOY 3). The extent of inpit dumping at this stage will also be estimated and illustrated.

- Review the EOY 3 Plan with CS Energy and Golding, and receive approval to proceed to the EOY 6 Plan.

- Develop a mine situation plan at the stage when HCS dumping commences in the inpit dumps (nominally EOY 6). Pit progress will be unchanged from the March 2000 report. This plan will show the extent of HCS dumping in the expit dump and the preparation of a reservoir in the inpit dump ready to receive HCS. The exact timing will be governed by the existence of adequate capacity in the inpit waste dump to cater for efficient placement of HCS. This will require iterative analysis of dump development progress.

- Review the EOY 6 Plan with CS Energy and Golding, and receive approval to proceed with the remainder of the mine plans.

- Develop mine situation plans for the EOY 5, EOY 10, EOY 15 and EOY 20.

- Provide mining cross sections through all mine HCS reservoirs to illustrate compliance with the EMOS design criteria.

- Prepare a brief report describing the key planning and scheduling issues.

Exclusions

- The conceptual dump designs will not show construction details (individual batters and berms, temporary haulroads, water management structures, rehabilitation progress, etc). The design drawings will be to the same level of detail as in the March 2000 report.

- The study will not consider the HCS disposal methodology.

Variations

After completion of the EOY 3, EOY 6, EOY 9 and EOY 12 plans, it was agreed that a new waste dumping concept was required, for two reasons:

- to reduce the volume of mine waste dumped in the expit dump; and

- to eliminate a potential "bottleneck" with inpit dump capacity at the EOY 6.

The new concept involves constructing the initial HCS reservoir (in the expit dump) with 6.5 years of HCS disposal capacity, rather than three years as originally envisaged.

3. MINE WASTE AND ASH SCHEDULES

3.1 Introduction

The mine waste and coal production schedule has been retained from the 2000 study (Reference 1). The calculation of the volume of HCS requiring disposal is also unchanged from the 2000 study. However HCS from the power station will be disposed of in an ash dam at the power station until the EOY 3 after power station commissioning.

This section presents the schedules of material (both mine waste and HCS) to be dumped in the mine from project years -1 to 20.

3.2 Mine Waste and Coal Schedule

The mine production schedule for years -1 to 20 is reproduced from the 2000 study on Table 3.1.

Table 3.1

Mine Production Schedule

Item	Units	Yr-1	Yr1	Yr2	Yr3	Yr4	Yr5	Yr6	Yr7	Yr8	Yr9	Yr10	Yr11	Yr12	Yr13	Yr14	Yr15	Yr16	Yr17	Yr18	Yr19	Yr20	TOTAL
MINE WASTE																							
Overburden Volume	bcm	*2,026,267*	*4,317,605*	*3,697,755*	*4,076,293*	*4,279,380*	*4,423,086*	*4,537,523*	*4,643,642*	*4,684,979*	*5,419,274*	*4,811,623*	*6,062,621*	*4,947,864*	*4,465,313*	*5,672,818*	*6,259,945*	*4,443,681*	*6,157,263*	*6,769,499*	*6,778,770*	*6,896,634*	**105,371,836**
Interburden Volume	bcm	471,397	2,181,862	1,446,128	872,307	498,620	361,568	381,040	357,280	380,392	461,862	610,328	745,309	365,755	596,995	882,838	798,635	404,322	1,033,398	1,080,132	902,702	914,444	**15,747,317**
Total Mine Waste	bcm	***2,497,664***	***6,499,467***	***5,143,884***	***4,948,601***	***4,778,000***	***4,784,654***	***4,918,563***	***5,000,923***	***5,065,371***	***5,881,136***	***5,421,951***	***6,807,931***	***5,313,619***	***5,062,308***	***6,555,656***	***7,058,580***	***4,848,003***	***7,190,661***	***7,849,631***	***7,681,472***	***7,811,078***	**121,119,154**
Cumulative Total Mine Waste	**bcm**	***2,497,664***	***8,997,131***	***14,141,015***	***19,089,616***	***23,867,616***	***28,652,270***	***33,570,833***	***38,571,756***	***43,637,127***	***49,518,263***	***54,940,214***	***61,748,145***	***67,061,764***	***72,124,072***	***78,679,728***	***85,738,309***	***90,586,311***	***97,776,972***	***105,626,603***	***113,308,075***	***121,119,154***	
ROM COAL																							
ROM Coal (rom) Uncovered	t	900,000	2,500,000	2,500,000	2,500,000	2,500,000	2,500,000	2,500,000	2,500,000	2,500,000	2,500,000	2,500,000	2,500,000	2,500,000	2,500,000	2,500,000	2,500,000	2,500,000	2,500,000	2,500,000	2,500,000	2,500,000	**50,900,000**
ROM Coal in stocks at start of period																							
ROM Coal (rom) Tonnage	t	0	300000	300000	300000	300000	300000	300000	300000	300000	300000	300000	300000	300000	300000	300000	300000	300000	300000	300000	300000	300000	
ROM Coal (rom) Ash	% ar	0.00	25.30	26.98	26.54	26.01	25.46	24.86	25.06	25.12	26.55	25.46	25.04	25.56	25.85	25.80	25.98	25.40	25.76	26.13	26.40	26.40	
ROM coal to Power Station																							
ROM Coal (rom) Tonnage	t	600,000	2,500,000	2,500,000	2,500,000	2,500,000	2,500,000	2,500,000	2,500,000	2,500,000	2,500,000	2,500,000	2,500,000	2,500,000	2,500,000	2,500,000	2,500,000	2,500,000	2,500,000	2,500,000	2,500,000	2,500,000	**50,600,000**
ROM Coal (rom) Ash	% ar	24.84	25.59	25.62	25.25	24.69	24.31	24.56	24.64	24.84	24.57	24.37	24.62	24.76	24.37	24.84	24.57	24.03	24.92	25.20	25.06	24.97	**24.79**
ROM Coal in stocks at end of period																							
ROM Coal (rom) Tonnage	t	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	**300,000**
ROM Coal (rom) Ash	% ar	25.30	26.98	26.54	26.01	25.46	24.86	25.06	25.12	26.55	25.46	25.04	25.56	25.85	25.80	25.98	25.40	25.76	26.13	26.40	26.40	26.27	**26.27**
POWER STATION ASH																							
Ash Tonnage	t	149,054	639,712	640,516	631,163	617,153	607,711	613,980	616,059	620,881	614,194	609,207	615,511	618,881	609,204	620,926	614,188	600,866	623,012	630,007	626,557	624,148	**12,542,930**
HCS Volume	**lcm**	**155,264**	**666,367**	**667,204**	**657,462**	**642,867**	**633,032**	**639,563**	**641,728**	**646,751**	**639,786**	**634,590**	**641,157**	**644,668**	**634,587**	**646,797**	**639,779**	**625,902**	**648,970**	**656,257**	**652,664**	**650,154**	13,065,552
Cumulative HCS Volume	**lcm**	**155,264**	**821,631**	**1,488,835**	**2,146,297**	**2,789,164**	**3,422,196**	**4,061,759**	**4,703,487**	**5,350,239**	**5,990,024**	**6,624,615**	**7,265,772**	**7,910,440**	**8,545,027**	**9,191,825**	**9,831,604**	**10,457,506**	**11,106,477**	**11,762,734**	**12,415,398**	**13,065,552**	

During this period a total of 121.12 million bank cubic metres of waste will be mined and 50.60 million ROM tonnes of coal at an average ash content of 24.8 percent as received will be delivered to the power station.

3.3 Power Station Ash Schedule

The ash contained in the 50.60 million ROM tonnes of coal delivered to the power station is estimated at 12.55 million tonnes (Reference 1). It has been allowed that 100 percent of the contained ash will require disposal as HCS.

The volume of HCS is estimated using the following formula:

$$\text{HCS (cubic metres)} = \text{Ash (tonnes)} \times \frac{100}{(100 - M)} \times \frac{1}{D}$$

Where M = HCS Moisture Content (20%)
And D = HCS Relative Density (1.20)

Over the scheduled mining period from Year -1 to Year 20, a total of 13.07 million cubic metres of HCS will require disposal. See Table 3.1. This consists of the 2.15 million cubic metres of HCS dumped until the EOY 3 in the power station ash dam, and the 10.92 million cubic metres of HCS dumped in the mine waste dumps during years 4 to 20.

4. CONCEPTUAL DUMP DESIGN

4.1 Introduction

This section describes the design of the expit and inpit waste dumps in the mine – in terms of shape, height and volumetric capacity. Dump locations, slopes and heights have been designed to meet environmental, hydrological and operational criteria. Volumetric capacity has been engineered to accommodate waste rock from the mine and HCS from the power station in a series of HCS reservoirs constructed from mine waste rock.

Mine situation plans are presented at project years 3, 6, 9, 12, 15, 18 and 20 to describe the status of the construction of the waste dumps and HCS reservoirs.

4.2 Design Criteria

4.2.1 Mine Design Criteria

The conceptual design criteria used in the 2000 study have been retained for the current study. See Table 4.1.

Table 4.1

Mine Design Criteria

	Units	
Mining Strip Width	metres	100
Ramp Gradient	percent	10
Haulroad Width	metres	25
Pit Wall Angle (coal zone)	degrees	90
Pit Wall Angle (overburden)	degrees	60
Levee Width at Top	metres	10 (minimum)
100 Year Flood Level	metres	RL312.5
Levee Elevation	metres	RL314
Swell Factor into Waste Dumps		1.15
Final Dump Slope Angle	degrees	10
Advancing Dump Face (overall)	degrees	16
Dump Face Adjacent to Ramps	degrees	21
Angle of Repose of Waste	degrees	37

The Advancing Dump Face (Overall) Slope Angle of 16 degrees is a provision, based on experience in other inpit dumping studies. Detailed mine design is required, incorporating individual dump batters and berms, and temporary haulroads and ramps before a more accurate overall dump slope angle (and therefore inpit dump volume) can be estimated.

4.2.2 Ash Reservoir Design Criteria

The Environmental Management Overview Strategy (EMOS) for the Kogan Creek Coal Project describes the method of emplacement and specifications for the HCS reservoirs in the mine waste dumps. See Appendix A.

The key criteria are summarized on Table 4.2.

Table 4.2

HCS Reservoir Design Criteria

Parameter	Units	Expit Dump	Inpit Dump
Minimum Wall Thickness	metres	50	50*
Minimum Buffer Thickness Against Pit Wall	metres	N/A	30
Minimum Thickness of Lining Material on Floor of Reservoir	metres	3	2
Minimum Thickness of Lining Material on Sides of Reservoir	metres	3	0**
Minimum Thickness of Lining Material on Top of Reservoir	metres	3	3***
Maximum Permeability of Lining Material	m/sec	10^{-8}	10^{-8}

** Not stated in EMOS. Assumed 50 metres.*
*** Except on highwall side of reservoir adjacent to the final pit void, where 3 metres is required.*
**** Not stated. Assumed 3 metres.*

This study has not considered the engineering properties of the mine waste, nor its suitability for use as a reservoir lining and capping material with a permeability not exceeding 10^{-8} metres per second (as required by the EMOS).

4.2.3 Water Storage Design Criteria

The EMOS requires the provision of two ponds as part of the water management scheme to ensure no discharge of contaminated waters offsite: an Industrial Pond (100 megalitres capacity) and a Pit Pond (100 megalitres capacity). In the conceptual mine situation plans (Section 4.4), both ponds have been designed in the ROM pad. The Pit Pond could be relocated to a more convenient site if required.

The EMOS also requires an Environmental Dam of 1,000 megalitres capacity but the design of this dam is outside the scope of this study.

4.3 Dumping Strategy

The original concept for mine waste and HCS disposal was:

- ash dumped in an ash reservoir adjacent to the power station until the end of project Year 3 (EOY 3);
- the mine constructs the expit dump incorporating an HCS reservoir by the EOY 3.
- HCS dumped in the expit HCS reservoir until nominally EOY 6 or EOY 7.

- the mine constructs inpit waste dumps incorporating HCS reservoirs ready for HCS disposal when the expit HCS reservoir is full (nominally EOY 6 or EOY 7).

- The mine continues through to EOY 20, building HCS reservoirs in the inpit dumps to allow continuous HCS disposal until the end of the mine life (EOY 20).

This concept was found to be unworkable, with insufficient space in the inpit dumps at EOY 6 to accommodate the mine waste and an HCS reservoir of sufficient capacity.

The final dumping strategy adopted involves creating a larger HCS reservoir (approximately six and a half years HCS dumping capacity) in the expit dump. HCS dumping inpit does not commence until mid Year 10 by which time there is sufficient space for mine waste disposal, an inventory of available inpit dump capacity for the next half strip of waste production, and an HCS reservoir of nearly three years disposal capacity.

Thereafter, new HCS reservoirs are created every three years to provide for continuous HCS disposal in the mine.

4.4 Mine Situation Plans

A total of seven mine situation plans have been designed, at the end of project years 3, 6, 9, 12, 15, 18 and 20. See Figures 4.1 to 4.7. Cross-sections through the dumps and HCS reservoirs also show their development over the mine life. See Appendix B.

Key concepts of the mine plan are:

- encirclement of the pit by levees and dumps at a minimum elevation of RL 314 at all times during the mine life (the 100 year flood design level is RL 312.5);

- location of diversion channels retained from 2000 study;

- expit dump and ROM pad footprint unchanged from 2000 study;

- layout of ROM coal stockpiles, ponds and facilities on ROM pad provided by Golding; and

- layout of coal conveyor and access roads provided by CS Energy.

Figure 4.1

Mine Situation Plan EOY 3

MINING LEASE

ROM Pond

Coal

Coal

Coal

Industrial Pond

Laydown

Workshop

Office/Crib

Fuel

RL 316

RL 316

RL 336.5

HCS Res 1
Floor RL 320

RL300

RL310

25

RL 314

Pit floor

Coal & burden benches

RL 313

RL312.5 100 year flood design level

PROPOSED DIVERSION CHANNEL

20 YEAR EXTRACTION LIMIT

RL 314

10

PROPOSED DIVERSION CHANNEL

20 YEAR EXTRACTION LIMIT

N

LEGEND:

- Pit floor
- Coal & burden benches
- Diversion
- Levee
- Dump RL 340
- Dump RL 320
- Dump RL 310
- Dump RL 300
- Dump RL 290
- Dump RL 280
- Dump RL 270
- HCS

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KOGAN CREEK MINE

SITUATION PLAN

END OF YEAR 3

Job No.: 4712

PLAN NUMBER: 4.1

Figure 4.2

Mine Situation Plan EOY 6

MINING LEASE

ROM Pond

Coal

Coal

Coal

Industrial Pond

Laydown

Workshop

Office/Crib

Fuel

RL 316

RL 316

RL 336.5

HCS Res 1
Floor RL 320

RL340

RL320

RL320

RL 314

RL 313

RL280

RL280

Pit floor

Coal & burden benches

PROPOSED DIVERSION CHANNEL

RL312.5 - 100-year flood design level

20 YEAR EXTRACTION LIMIT

RL 314

20 YEAR EXTRACTION LIMIT

PROPOSED DIVERSION CHANNEL

25

10

N

LEGEND:

Pit floor	Diversion
Coal & burden benches	Levee
Dump RL 340	
Dump RL 320	
Dump RL 310	
Dump RL 300	
Dump RL 290	
Dump RL 280	
Dump RL 270	
HCS	

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GOLDING CONTRACTORS PTY LTD

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KOGAN CREEK MINE

SITUATION PLAN

END OF YEAR 6

Job No.: 4712

PLAN NUMBER: 4.2

Figure 4.3

Mine Situation Plan EOY 9

MINING LEASE

ROM Pond

Coal

Coal

Coal

Industrial Pond

Laydown

Workshop

Office/Crib

Fuel

RL 316

RL 316

RL 336.5

HCS Res 1
Floor RL 320

N

25

RL340

HCS Res 2
Floor RL320

RL 316

RL340

HCS Res 3
Floor RL320

RL 314

RL 313

PROPOSED
DIVERSION
CHANNEL

RL280

RL280

Pit floor

Coal & burden benches

RL 314

10

20 YEAR EXTRACTION LIMIT

20 YEAR EXTRACTION LIMIT

100 year flood design level

RL312.5

7020000

7019000

7018000

7017000

270000

280000

281000

282000

LEGEND:

Pit floor		Diversion	
Coal & burden benches		Levee	
Dump RL 340			
Dump RL 320			
Dump RL 310			
Dump RL 300			
Dump RL 290			
Dump RL 280			
Dump RL 270			
HCS			

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GOLDING CONTRACTORS PTY LTD

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KOGAN CREEK MINE

SITUATION PLAN

END OF YEAR 9

Job No.: 4712

PLAN NUMBER:

4.3

Figure 4.4

Mine Situation Plan EOY 12

MINING LEASE

ROM Pond

Coal

Coal

Coal

Industrial Pond

Laydown

Workshop

Office/Crib

Fuel

RL 316

RL 316

HCS Res 1
RL 339.5

25

RL340

HCS Res 2
Floor RL320

RL340

HCS Res 3
Floor RL320

RL 316

RL300

Pit floor

Coal & burden benches

RL 314

PROPOSED
DIVERSION
CHANNEL

HCS Res 4
Floor RL320

RL340

RL280

RL290

RL290

Pit floor

Coal & burden benches

20 YEAR EXTRACTION LIMIT

100 year flood design level

20 YEAR EXTRACTION LIMIT

RL 314

10

PROPOSED
DIVERSION
CHANNEL

N

7020000

7019000

7018000

7017000

270000

280000

281000

282000

LEGEND:

Pit floor		Diversion	
Coal & burden benches		Levee	
Dump RL 340			
Dump RL 320			
Dump RL 310			
Dump RL 300			
Dump RL 290			
Dump RL 280			
Dump RL 270			
HCS			

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KOGAN CREEK MINE

SITUATION PLAN

END OF YEAR 12

Job No.: 4712

PLAN NUMBER: 4.4

Figure 4.5

Mine Situation Plan EOY 15

MINING LEASE

ROM Pond

Coal

Coal

Coal

Industrial Pond

Laydown

Workshop

Office/Crib

Fuel

RL 316

RL 316

HCS Res 1
RL 339.5

25

HCS Res 2
RL340

HCS Res 3
RL340

RL320

RL280

Pit floor

Coal & burden benches

RL 314

PROPOSED DIVERSION CHANNEL

HCS Res 4
Floor RL320

HCS Res 5
Floor RL320

RL 316

RL300

RL300

RL270

Pit floor

RL280

Coal & burden benches

20 YEAR EXTRACTION LIMIT

RL 314

10

PROPOSED DIVERSION CHANNEL

20 YEAR EXTRACTION LIMIT

RL312.5 100 year flood design level

N

LEGEND:

Pit floor		Diversion	
Coal & burden benches		Levee	
Dump RL 340			
Dump RL 320			
Dump RL 310			
Dump RL 300			
Dump RL 290			
Dump RL 280			
Dump RL 270			
HCS			

CS ENERGY LTD
GOLDING CONTRACTORS PTY LTD

Date : November–2002 | Scale: 1:12,500 | Plot file:

KOGAN CREEK MINE

SITUATION PLAN

END OF YEAR 15

Job No.: 4712

PLAN NUMBER: 4.5

Figure 4.6

Mine Situation Plan EOY 18

MINING LEASE

ROM Pond

Coal

Coal

Coal

Industrial Pond

Laydown

Workshop

Office/Crib

Fuel

RL 316

RL 316

HCS Res 1
RL 339.5

25

HCS Res 2
RL340

HCS Res 3
RL340

HCS Res 4
RL340

HCS Res 5
RL340

RL320

RL 314

RL290

Pit floor

Coal & burden benches

100 year flood design level

20 YEAR EXTRACTION LIMIT

Floor RL300

HCS Res 6

Floor RL290

RL310

RL300

RL270

RL270

Pit floor

Coal & burden benches

20 YEAR EXTRACTION LIMIT

PROPOSED DIVERSION CHANNEL

PROPOSED DIVERSION CHANNEL

RL 314

TD

N

7020000

7019000

7018000

7017000

270000

280000

281000

282000

LEGEND:

- Pit floor
- Coal & burden benches
- Dump RL 340
- Dump RL 320
- Dump RL 310
- Dump RL 300
- Dump RL 290
- Dump RL 280
- Dump RL 270
- HCS
- Diversion
- Levee

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KOGAN CREEK MINE

SITUATION PLAN

END OF YEAR 18

Job No.: 4712

PLAN NUMBER: 4.6

Figure 4.7

Mine Situation Plan EOY 20

MINING LEASE

ROM Pond

Coal

Coal

Coal

Industrial Pond

Laydown

Workshop

Office/Crib

Fuel

RL 316

RL 316

HCS Res 1
RL 339.5

25

HCS Res 2
RL340

HCS Res 3
RL340

HCS Res 4
RL340

HCS Res 5
RL340

RL320

RL 314

PROPOSED DIVERSION CHANNEL

RL 316

RL312.5 100 year flood design level

HCS Res 7
Floor RL310

Floor RL300

HCS Res 6
RL320

Floor RL290

RL330

RL310

RL270

RL280

Pit floor

20 YEAR EXTRACTION LIMIT

Coal & burden benches

Pit floor

20 YEAR EXTRACTION LIMIT

Coal & burden benches

PROPOSED DIVERSION CHANNEL

RL 314

10

N

LEGEND:

Pit floor		Diversion	
Coal & burden benches		Levee	
Dump RL 340			
Dump RL 320			
Dump RL 310			
Dump RL 300			
Dump RL 290			
Dump RL 280			
Dump RL 270			
HCS			

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KOGAN CREEK MINE

SITUATION PLAN

END OF YEAR 20

Job No.: 4712

PLAN NUMBER: 4.7

The volumes of the dumps as designed in each situation plan match the volumes of mine waste scheduled for mining in the corresponding period to an accuracy commensurate with the reliability of the coal deposit model, the reliability of the average swell factor used (15%) and the accuracy of the allowance for overburden stripping in advance of coal mining.

Provision has been made to "cap" each HCS reservoir with a three metre thick lining of mine waste (as per the permeability specification) as soon as HCS disposal operations have been completed.

4.5 HCS Reservoir Capacities

The capacities of the HCS reservoirs as designed are summarised on Table 4.3.

Table 4.3

HCS Reservoir Capacities

Reservoir Name	Location	HCS Floor Level (RL)	HCS Top Level (RL)	HCS Depth (m)	HCS Volume (Mcu.m)	Capping Volume (Mcu.m)	Finished Level (RL)
# 1	Expit	320	336.5	16.5	**4.30**	1.16	339.5
# 2	Inpit	320	337	17	**1.62**	0.34	340
# 3	Inpit	320	337	17	**0.40**	0.10	340
# 4	Inpit	320	337	17	**1.38**	0.33	340
# 5	Inpit	320	337	17	**1.55**	0.35	340
# 6	Inpit	290,300	307	17,7	**1.65**	0.47	310
# 7	Inpit	320	337	17	**2.02**	0.42	340
TOTAL					**12.92**	**3.17**	

There is sufficient capacity (12.92 million cubic metres) for HCS disposal operations through to project Year 20.

4.6 Dumping Schedules

The mine waste dumping schedule is summarised on Table 4.4.

Table 4.4

Mine Waste Dumping Schedule

Project Years		Mine Waste Excavated (Mbcm)	Waste Dump Location				Total Waste Dumped (Mbcm)
From	To		Expit Dump (Mbcm)	Inpit Dump (Mbcm)	Reservoir Capping (Mbcm)	Reservoir Number	
-1	3	19.09	10.70	8.39			19.09
4	6	14.48		14.48			14.48
7	9	15.95		15.95			15.95
10	12	17.54		16.53	1.01	1	17.54
13	15	18.68		18.29	0.38	2, 3	18.68
16	18	19.89		19.30	0.59	4, 5	19.89
19	20	15.49		15.49			15.49
Total		**121.12**	**10.70**	**108.44**	**1.98**		**121.12**

Note : Reservoir No. 1 capping is on the expit dump.

The total mine waste volume to be dumped is 121.12 million bank cubic metres.

The HCS dumping schedule is shown on Table 4.5.

Table 4.5

HCS Dumping Schedule

Project Year	ROM Coal to Power Plant (Mt)	HCS Volume Generated (Mcu.m)	Disposal into HCS Reservoir (Mcu.m)								
			PP Ash Dam	# 1	# 2	# 3	# 4	# 5	# 6	# 7	Total
-1	0.60	0.16	0.16								0.16
1	2.50	0.67	0.67								0.67
2	2.50	0.67	0.67								0.67
3	2.50	0.66	0.66								0.66
4	2.50	0.64		0.64							0.64
5	2.50	0.63		0.63							0.63
6	2.50	0.64		0.64							0.64
7	2.50	0.64		0.64							0.64
8	2.50	0.65		0.65							0.65
9	2.50	0.64		0.64							0.64
10	2.50	0.63		0.46	0.18						0.63
11	2.50	0.64			0.64						0.64
12	2.50	0.64			0.64						0.64
13	2.50	0.63			0.16	0.40	0.08				0.63
14	2.50	0.65					0.65				0.65
15	2.50	0.64					0.64				0.64
16	2.50	0.63					0.01	0.61			0.63
17	2.50	0.65						0.65			0.65
18	2.50	0.66						0.29	0.37		0.66
19	2.50	0.65							0.65		0.65
20	2.50	0.65							0.63	0.02	0.65
Total	**50.60**	**13.07**	**2.15**	**4.30**	**1.62**	**0.40**	**1.38**	**1.55**	**1.65**	**0.02**	**13.07**

When compared with the dump construction schedule (see Figures 4.1 to 4.7), there is always reservoir capacity available for continuous HCS disposal over the 20 year mine life.

5. CONCLUSIONS AND RECOMMENDATIONS

1. Although conceptual only, the dump designs demonstrate that reservoirs of sufficient capacity can be constructed in the mine's waste dumps to provided for HCS disposal continuously from EOY 3 to EOY 20.

2. The HCS reservoir locations (expit and inpit) will provide for ash dumping operations to proceed with minimal interference to contract mining operations.

3. The conceptual designs have not been optimised. Detailed short term planning is required, particularly through to EOY 4, to optimise the haulage layout, pit ramp locations and strip width to suit the proposed mining method. This may necessitate some adjustments to the HCS reservoir designs.

4. Detailed short term planning should include the design of the Environmental Dam and scheduling of topsoil stripping, storage and placement.

5. The minimum volume of mine waste which must be dumped in the expit dump (because it cannot be accommodated inpit) in Years -1, 1 and 2 is 10.70 million bank cubic metres. A further 1.01 million bank cubic metres of waste has been scheduled to the expit dump in Year 10 to provide a capping over the HCS.

6. As well as meeting coal tonnage and quality targets, a key scheduling criterion for the mining contractor will be the rate of advance of mining in O Seam. This governs the rate of exposing the pit floor, and hence the rate at which the inpit dump can expand. After the expit dump is constructed (EOY 2), mine waste dumping will be inpit only. Consequently sufficient inpit dumping capacity must be maintained throughout the mine life.

   It is likely that coal production (particularly from O Seam) will occasionally need to exceed the target for the reasons given above. This coal may require storage on the ROM pad in temporary stockpiles. The likely capacity of these "surge" stockpiles has not been estimated.

7. The size of the mine waste dumps is sensitive to the accuracy of the swell factor used (15%) the operational achievement of the design slope angles used and the volume of overburden stripped in advance of coal mining.

6. REFERENCES

1. Kogan Creek 20 Year Mine Plan, Report No. 3624a, Runge Pty Ltd, March 2000.

Appendix A

EMOS Requirements for HCS Reservoirs

Appendix B

Cross Sections through HCS Reservoirs and Mine Dumps

MINING LEASE

ROM Pond

Coal

Coal

Coal

Industrial Pond

Laydown

Workshop

Office/Crib

Fuel

RL 316

Section A

Section B

Section C

HCS Res 1
RL 339.5

RL 316

25

HCS Res 2
RL340

HCS Res 3
RL340

HCS Res 4
RL340

HCS Res 5
RL340

RL320

RL 314

PROPOSED
DIVERSION
CHANNEL

RL 316

HCS Res 7
Floor RL310

Floor RL300

HCS Res 6
RL320

Floor RL290

RL310

RL330

RL270

RL280

Pit floor

20 YEAR EXTRACTION LIMIT

Coal & burden benches

RL 314

10

PROPOSED
DIVERSION
CHANNEL

RL312.5 100 year flood design level

Pit floor

20 YEAR EXTRACTION LIMIT

Coal & burden benches

LEGEND:

Pit floor		Diversion	
Coal & burden benches		Levee	
Dump RL 340			
Dump RL 320			
Dump RL 310			
Dump RL 300			
Dump RL 290			
Dump RL 280			
Dump RL 270			
HCS			

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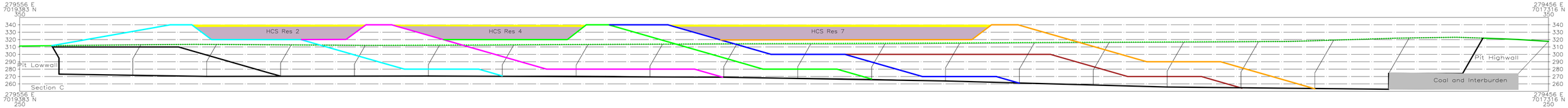
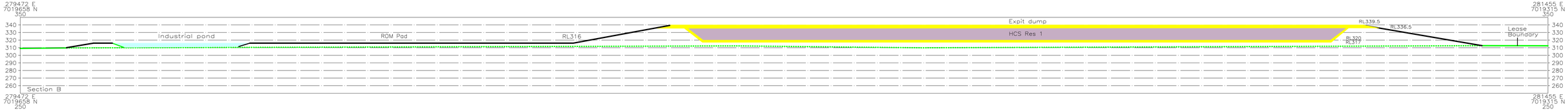
KOGAN CREEK MINE

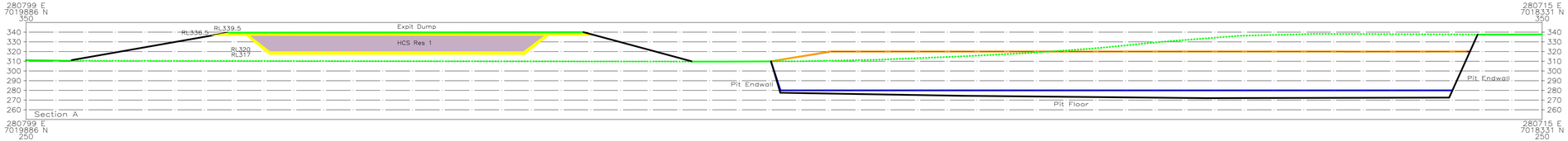
SECTION LOCATION PLAN

Job No.: 4712

PLAN NUMBER:







Metres
25 0 25 50 75 100

SCALE 1 : 2,500

LEGEND:

- Topography
- Mining block
- Year 3
- Year 6
- Year 9
- Year 12
- Year 15
- Year 18
- Year 20

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KOGAN CREEK MINE

CROSS SECTIONS

A to C

Job No.: 4712

PLAN NUMBER: